CLAIMS

What is claimed is:

1. An acoustic wave identification transponder device, having a substrate, an electroacoustic transducer generating an acoustic wave in said substrate and a set of encoding elements disposed to interact with energy of the acoustic wave for modifying a waveform thereof, comprising an element disposed along the path of the acoustic wave which interacts with, and reemits, at least a portion of the acoustic wave along an exit acoustic path which is not parallel to an incident acoustic path.

2. The device according to claim 1, further comprising at least one additional element disposed along a path of the acoustic wave which interacts with, and reemits, at least a portion of the acoustic wave along an exit acoustic path which is not parallel to an incident acoustic path

3. The device according to claim 1, wherein said element redirects at least a portion of the acoustic wave at right angles.

4. The device according to claim 1, wherein said element allows at least a portion of the acoustic wave to pass coaxially with said incident acoustic path.

5. The device according to claim 1, wherein said element redirects the axis of propagation of the acoustic wave with high efficiency.

6. The device according to claim 2, wherein said additional element acts in sequence with said element to redirect a portion of the acoustic wave.

7. The device according to claim 6, wherein an exit path of said element is parallel to an exit path of said additional element.

8. The device according to claim 6, wherein an exit path of said element is antiparallel to an exit path of said additional element.

9. The device according to claim 1, wherein the acoustic energy is reflected back along its incident path.

10. The device according to claim 1, wherein the acoustic energy follows a path on said substrate substantially without backtracking along an incident path.

11. The device according to claim 1, wherein said substrate is piezoelectric and said element comprises a conductor deposited on a surface of said piezoelectric substrate.

12. The device according to claim 1, wherein said element comprises a right angle trackchanger.

13. The device according to claim 1, wherein said substrate comprises a piezoelectric composition, and said element comprises an arrangement of conductive strips arranged to transduce an incident acoustic wave traveling in said piezoelectric substrate into electric signals in said conductive strips, and a further arrangement of conductive strips arranged to transduce the electric signals into an emitted acoustic wave propagating in said piezoelectric substrate, a path of the incident acoustic wave differing from a path of the emitted acoustic wave.

14. The device according to claim 2, wherein said element and said additional element are together configured as a reflective array compressor.

15. The device according to claim 1, wherein said element is part of an array of semireflective elements disposed along an acoustic path of the acoustic wave. elements of said array selectively reflecting portions of the acoustic wave along axes having a propagation component orthogonal to an incident acoustic wave and allowing other portions to pass unreflected.

16. An acoustic wave identification transponder device, having a substrate, an electroacoustic transducer generating an acoustic wave in said substrate and a set of encoding elements disposed in a path of the acoustic wave for modifying the acoustic wave, wherein the improvement comprises said encoding elements together selectively modifying a phase and amplitude of an incident acoustic wave to quadrature amplitude encode information on the acoustic wave.

17. A method of modulating an acoustic beam having a beamwidth, comprising the steps of selectively providing, along a path of the acoustic beam, one or more elements which impose a phase delay on the acoustic wave, wherein at least a portion of elements are disposed over only a portion of the beamwidth.

18. The method according to claim 17, wherein said element comprises a set of members disposed bilaterally symmetrical with respect to an axis of acoustic beam propagation.

19. The method according to claim 17, wherein at least a subset of said elements modulate the acoustic beam in a QAM constellation pattern, wherein said QAM constellation pattern has about 2^n states, and wherein n is an integer greater than or equal to 2.

20. The method according to claim 17, further comprising the step of equalizing a phase delay of portions of said acoustic beam across the width of the acoustic beam after passing said elements and prior to any transducing of the entire acoustic wave into an electrical signal.

21. The method according to claim 17, further comprising the step of splitting the acoustic beam after passing said elements and subjecting a portion of said split beam to a further set of elements for modulating said acoustic beam.

22. The method according to claim 21, wherein said further set of elements includes structures or equalizing a relative phase delay across the beamwidth and imposing a further net phase delay to at least a portion of the acoustic wave.

23. A method of modulating an acoustic wave, comprising generating an acoustic wave on a substrate, said acoustic wave propagating along a propagation axis and having a beam width along an axis perpendicular to the propagation axis, providing a phase delay pad disposed along the propagation axis within the beam width, occupying less than the entire beam width; summing the acoustic power of the acoustic beam after interaction with the phase delay pad; and outputting the summed acoustic power.

24. The method according to claim 23, further comprising the steps of, before said summing step, splitting the energy of the acoustic beam, equalizing a phase delay of respective portions of the beam width, providing an additional phase delay pad disposed along the propagation axis within the equalized beam width, occupying less than the entire equalized beam width; and summing the acoustic power of the equalized acoustic beam after interaction with the additional phase delay pad, said outputting the summed acoustic power step comprising outputting a split portion of the acoustic beam and outputting the summed acoustic power of the equalized acoustic beam.

25. A device for modulating an acoustic beam having a beamwidth, comprising: one or more elements disposed along a predetermined path of an acoustic beam on a substrate, said elements being adapted for imposing a phase delay on the acoustic wave, wherein at least a portion of elements are disposed over only a portion of the beamwidth.

26. The device according to claim 25, wherein said element comprises a set of members disposed symmetrical with respect to an axis of acoustic beam propagation.

27. The device according to claim 25, wherein at least a subset of said elements are adapted to modulate the acoustic beam in a QAM-16 constellation pattern.

28. The device according to claim 25, further comprising a structure for equalizing a phase delay of portions of said acoustic beam across the width of the acoustic beam after passing said elements and prior to interacting with a full beam width acousto-electric transducer.

29. The device according to claim 25, further comprising a splitter for splitting the acoustic beam, disposed past said elements along an acoustic beam propagation path, and a further set of elements for modulating said acoustic beam disposed to interact with a split portion of the acoustic beam.

30. The device according to claim 25, wherein said further set of elements includes structures or equalizing a relative phase delay across the beamwidth and imposing a further net phase delay to at least a portion of the acoustic wave.

31. A device for modulating an acoustic wave, comprising an electroacoustic transducer for generating an acoustic wave on a substrate, said acoustic wave propagating along a propagation axis and having a beam width along an axis perpendicular to the propagation axis, a phase delay pad disposed along the propagation axis within the beam width, occupying less than the entire beam width; and a summer for summing the acoustic power of the acoustic beam after interaction with the phase delay pad.

32. The device according to claim 31, further comprising a splitter, disposed before said summer, adapted for splitting the energy of the acoustic beam; a phase delay equalizer for equalizing a phase delay of respective portions of the beam width; an additional phase delay pad disposed along the propagation axis within the equalized beam width, occupying less than the entire equalized beam width; and a further summer for summing the acoustic power of the equalized acoustic beam after interaction with the additional phase delay pad.

33. The device according to claim 25, wherein at least a subset of said elements are adapted to modulate the acoustic beam in a QAM constellation pattern having about 2^n evenly spaced signal states in said QAM constellation, wherein n is an integer greater than 1.